Safe Food

Health Objectives for the Year 2010: Reduce the incidence of foodborne illness and assure the public is provided safe wholesome food.

Health Implications

Major changes in the food system, including a growing at-risk population; declining safe food- preparation practices, an increasingly diverse industry and global food supply, newly emerging pathogens; and changes in the consumer lifestyles are placing Americans at greater risk of foodborne illness.[1] Some of the pathogens of greatest concern today (e.g., *Campylobacter jejuni*, *Escherichia coli 0157:H7*, *Listeria monocytogenes*, *Cyclospora cayetanensis*) were not recognized as foodborne illnesses in the 1970s.

Foodborne illness can occur in people of all ages, but it is of special concern in the very young, immunocompromised, and older populations. Infants and toddlers are highly susceptible to dehydration caused by foodborne illness. For immunocompromised and older populations, especially those with underlying chronic health conditions, foodborne diseases can be life-threatening. The number of elderly and immunocompromised people who are at greater risk is increasing.

In milder forms, foodborne illness symptoms can include vomiting, fever, cramps and/or diarrhea which may last for several hours. In more virulent forms, such as botulism, infection by Escherichia coli 0157:H7 or Listeria, or chemical poisoning, foodborne disease can be fatal.

Three categories of hazards are responsible for foodborne illness, commonly referred to as "food poisoning" by both the public and the medical community: biological (i.e., bacteria, viruses, parasites); chemical (pesticides, cleaners, heavy metals); and physical (hair, glass, metal particles).[1]

Biological hazards pose the greatest threat to food safety and compose the vast majority of reported foodborne illnesses. Biological hazards can be subdivided into foodborne infections and foodborne intoxications.

A foodborne *infection* is an illness that results from eating food that contains harmful live microorganisms, which then often grow and reproduce in the human intestinal system. Common examples of bacterial foodborne infections are *Escherichia coli 0157:H7*, *Salmonella*, *Campylobacter*, and *Listeria*. Parasitic microbes are *Giardia* and *Cryptosporidium*. Hepatitis A and the Norwalk virus cause viral infections.

A foodborne intoxication (poisoning) is an illness that results from eating food that contains poisons or toxins. Illness may result from natural toxins

Table 1. Safe Food Indicators

	Lancaster Recent	Lancaster Objective 2010	Nebraska Recent	Nebraska Objective 2010	National Recent	National Objective 2010[1]
Foodborne illness incidence per 100,000 population						
Incidence of Salmonella	14.9/12.8[2]	7.0	11.5[3]	--	13.8[4]	6.9
Incidence of Campylobacter	11.9/17.6[2]	9.0	20.2[3]	--	23.0[4]	11.5
Safe food handling by adult consumers						
Percent who wash hands before preparing food	--[5]	95.0	--	--	--	--
Percent who wash hands after touching raw meat or poultry	--[5]	95.0		--	77.0[6]	87.0
Percent who wash cutting board or use a different cutting board after cutting raw meat or poultry	--[5]	91.0	--	--	81.0[6]	91.0
Percent who cook hamburgers thoroughly	--[5]	90.0	--	--	80.0[6]	90.0
Percent who refrigerate leftover food promptly	--[5]	94.0	--	--	89.0[6]	94.0
Safe food handling at food establishments as measured at regular inspection visits[7]						
Percent of food establishments with "Critical Item" violation(s)	70.1[8]	50.0	--[9]	--	--	--
Average number of critical item violations	1.1[8]	<1.0	2.0[10]	--	--	--
Percent of food establishments with temperature violation(s)	--[11]	10.0	--[9]	--	--	--
Percent of food establishments with personal hygiene violation(s)	--[11]	25.0	--[9]	--	--	--
Average number of total violations per regular inspection	8.3[8]	7.0	8.0[10]	--	--	--
Average number of "Notice of Violation" & "Food Enforcement Notices" given for violation of Food Handler/Manager Permit requirements per 1000 regular inspections	20/7[12]	10/3	--[9]	--	--	--

found in certain plant leaves, roots, fruits, grains, mushrooms, or fish. Disease can also result from the ingestion of foods contaminated with microorganisms that produce toxins. Common sources of foodborne toxins are *Escherichia coli 0157:H7*, *Staphylococcus aureus*, *Clostridium botulinum*, and *Bacillus cereus*.

Basic preventive measures are encouraged by LLCHD through inspections and educational efforts, thereby reducing the likelihood of foodborne illness from biological hazards. Basic preventive measures include using food only from approved sources; good personal hygiene; preventing cross contamination; and the proper heating, cooling, thawing, and storing of food.

Although less common, chemical hazards arise from the improper use of pesticides, cleaning chemicals, additives, preservatives (e.g., sulfites and Monosodium Glutamate), and heavy metals. Of course, chemical and metal products should be used only as specified on the label and only for intended purposes.

Physical hazards may arise from faulty or deteriorating utensils and equipment or from improperly inspected incoming food items in a food establishment. Physical hazards can come from poor food handling practice if the food handlers are wearing jewelry, false fingernails, chipping fingernail polish, or adhesive bandages.

A key to the prevention of illness in food establishments is a sound inspection and education program that identifies the "critical items" most closely associated with foodborne illness.

A strong public education program can bolster protection of the public health through safe food handling procedures used at home, private parties, nonprofit gatherings, and many volunteer-run food-service operations. Consumer education activities should include culturally sensitive material relevant to all groups of people, including members of various ethnic groups and individuals with increased susceptibility to foodborne illness.[2]

Current Status and Trends

On January 25, 1997, President Clinton announced a Food Safety Initiative (FSI) with the single mission "to reduce the incidence of foodborne illness to the greatest extent possible." Major changes in the food system and consumer lifestyles were placing Americans at greater risk of foodborne illness; therefore, the FSI acknowledges that these changes present increasing challenges to the nation's food-safety system. The federal government's food safety agencies, the Food and Drug Administration (FDA), the Centers for Disease Control (CDC), U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (EPA), are working together on the FSI.

The FDA sets and enforces standards for composition, quality, nutrition, labeling, additives, sanitation, and safety of foods sold in interstate commerce, except for meat, eggs, and poultry. The CDC is not a regulatory agency, but it works with regulatory agencies during outbreak investigations to determine the origins of contaminated food and the reasons for the outbreak.

In 1993 the FDA implemented a new model food code, which has been updated biennially. Requests for changes in the FDA code come from both regulators and the food industry and are reviewed at the Conference for Food Protection.

In 1997 Nebraska adopted the 1995 FDA model food code with some modifications. Revisions to the State Food Code were adopted in 1999. The

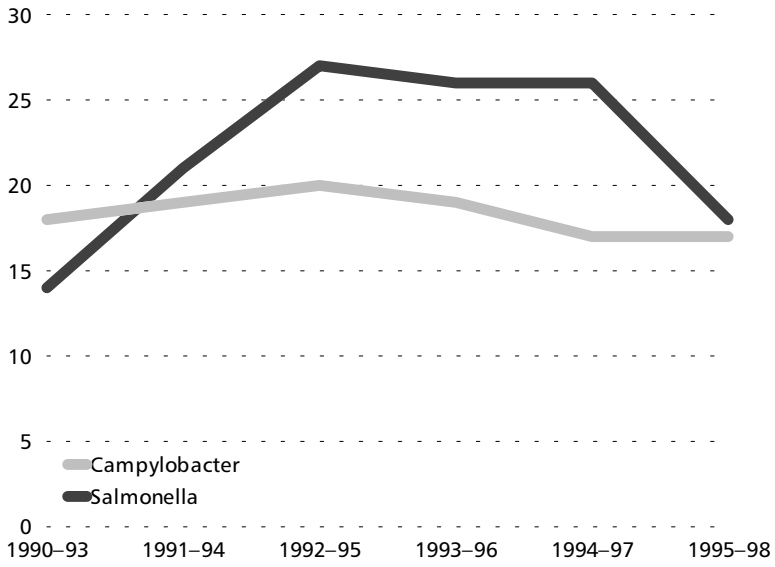

Figure 1: Incidence of Campylobacter and Salmonella in Nebraska and Lancaster County.

Lincoln Food Code adopts the State Food Code by reference.

The USDA regulates the slaughtering of animals and processing of meats (except seafood) as well as the quality of perishable agricultural commodities. The EPA registers pesticides for use on food products, sets acceptable limits for pesticide residues, and registers sanitizing agents.

Federal regulation is primarily aimed at food processing and interstate transport. State departments of health or agriculture, or local health departments, have primary responsibility for inspecting and providing educational services to food establishments.

LLCHD has local authority within the three-mile limit of Lincoln for its food-establishment permitting and inspection program. LLCHD requires permitting of all food managers and handlers. All employees in a Lincoln food establishment must have either a food manager or food handler permit. Every establishment must employ at least one permitted food manager. The food handler permitting program has evolved over the years to include training and testing for five levels of permits.

LLCHD Environmental Health Specialists (who make inspections) assure that any critical-item violation at a food establishment is quickly corrected. They provide on-the-spot education for the operator regarding the seriousness of the violation and the importance of preventing any reoccurrence.

Locally, consumer education in safe food preparation and handling is an activity of University of Nebraska and Lancaster County Cooperative Extension personnel, with the support of LLCHD.

Nationally the trend is toward increasing diversity in the food industry, which is characterized by a large, highly diverse population of employees; a high rate of employee turnover; language and literacy barriers; and nonuniform systems among the states for training and certifying workers.[3]

Due to the extremely low unemployment rate in Lincoln, the local food-service industry continues to have difficulty finding and keeping employees. Turnover of staff not only stresses the remaining staff, it creates a training and public health issue as new employees are hired and quickly put to work. Establishments that take the time to assure proper training and competency have a large investment in their workers and they realize that providing safe food is essential. Local code requires a food-service employee to get a food handler's permit within the first 30 days of work. However, additional training and oversight by the person in charge of the food establishment is critical in preventing foodborne illness.

A local trend is toward more and expanding "farmer's markets." In Nebraska a produce farmer can sell fresh produce without a permit. The farmer's markets have also traditionally included "homemade" products, such as nonpotentially hazardous baked goods. But farmer's markets are expanding in number, size, and the diversity of products sold. This creates an ever-changing situation which needs monitoring to keep up with the changes as they appear. Lincoln restricts the food products sold to "nonpotentially hazardous foods" approved by the depart-

ment, unless the product is commercially produced in a permitted facility. Regular inspections at the markets and required food-vendor training both serve to increase the safety of these homemade products served to the public.

Another trend in food service is the increasing number of temporary food stands at more frequent events and festivals, which creates additional food safety and sanitation concerns. These temporary food establishments can prepare food on site and they often serve large numbers of people in a very short time period. Hot and cold food holding, proper cooking, hand washing, fly control, general sanitation and employee hygiene and health are all important issues that must be monitored at these short-term events.

The CDC estimates that each year there are 76 million cases of foodborne illnesses in the United states, 13.8 million from known pathogens. An estimated 325,000 hospitalizations and 5,020 deaths annually are attributed to foodborne illness.[4]

Four bacteria – *Salmonella*, *Campylobacter*, *Escherichia coli 0157:H7*, and *Listeria* – are considered the most important known causes of foodborne disease in the United States.

LLCHD has investigated several large foodborne illness outbreaks over the past five years. LLCHD forms an "Epi Team" to investigate and work through the events of an outbreak as soon as one is identified. In Lancaster County the LLCHD epidemiological surveillance and investigation of foodborne illness are done by the Epi Team, including the Health Director, Environmental Health Food Team, the Epidemiologist, Public Health Nursing staff and Health Promotion and Outreach representatives. The following are a few of the investigations the Epi Team has worked on over the past five years.

In May 1995, 169 people developed *Salmonella* gastroenteritis from barbecued pork prepared by an unlicensed, out-of-county caterer. The cause of this outbreak was improper cooking temperatures, improper cooling, and insufficient reheating of frozen packaged pork. This pork was sold to hosts of 13 wedding and graduation parties, two of which were in Lancaster County.

In December 1995 *Bacillus cereus* and the toxins it produced caused a foodborne outbreak at a manufacturing company's catered Christmas party. Approximately 100 of the 240 employees reported that they became ill. Both the fried chicken and roast beef were implicated by the statistical analysis and then confirmed through laboratory testing of the leftover food. Inadequate cooking or improper holding temperatures were implicated.

In January 1997 a banquet attended by 205 people reported a number of people ill. Lab results of tested leftover food confirmed that the roast beef was contaminated with *Clostridium perfringens*. The food establishment used an improper cooling procedure, allowing the growth of this pathogen.

In September 1997 Giardia was confirmed by laboratory analysis to have caused an outbreak affecting 181 out of 267 UNL marching band members who had consumed ice water from large insulated containers. One or more students who were ill with Giardia contaminated the water by dipping used cups directly into the coolers. The contaminated water then spread the organism.

In June of 1999 over 100 people became ill following a catered retirement party at the State Capitol. Nebraska State Health and Human Services determined that the cause was the foodborne calici (Norwalk) virus.

In October 1999, *Staphylococcus enterotoxin* caused a foodborne outbreak in two separate day-care facilities that had the pizza delivered for lunch.

	Total illnesses	Total hospital	Total deaths
Salmonella	9.7%	26.4%	30.7%
Listeria	0%	3.8%	27.6%
Toxoplasma	0.8%	4.1%	20.7%
Norwalk-like Virus	66.6%	32.9%	6.9%
Campylobacter	14.2%	17.3%	5.5%
E.coli 0157:H7	0.5%	3.0%	2.9%

Table 2: CDC's estimatation of total foodborne illnesses, hospitalizations, and deaths.

Seven adults and two children had diarrhea and nausea within two hours of eating their lunch. The illnesses were reported to LLCHD and the cause was confirmed through laboratory testing of the leftover pizza.

Success in reducing the incidence of foodborne illness is difficult, owing to the change in epidemiology of foodborne diseases, increased demand for fresh foods year round, and the appearance of emerging pathogens in new products.[5] In addition, changes in the current surveillance systems may modify the resulting incidence rate. For example, if the identification and reporting of a certain infection is improved, its' numbers may increase. However, the majority of foodborne illness is viral and often not easily confirmed by current laboratory testing. It therefore remains unidentified.

The costs of foodborne illness, including medical care and lost productivity, are staggering. The USDA estimates that the medical costs and productivity losses for seven specific foodborne pathogens range between $6.5 billion and $34.9 billion annually. Total costs for all foodborne illnesses are likely to be much higher. Furthermore, this estimate does not include the total burden placed on society by the chronic illness caused by some foodborne pathogens.[6] Loss of business and lawsuits are the major cost factors, but loss of income for victims and infected food handlers is considerable. The costs of foodborne illness impact society directly or indirectly every day.

As the year 2010 approaches, traditional agents of foodborne illness are expected to continue posing considerable health risk. In response to this concern, the food-processing industry and the FDA are taking steps to reduce foodborne illness. For example, in the 1990s poultry processing came under increased scrutiny since it was estimated that 10% of all foodborne disease (primarily *Campylobacter* and *Salmonella*) was associated with poultry consumption. Poultry processing procedures have been modified to reduce contamination of the meats and the rates of *Salmonella* and *Campylobacter* have subsequently been declining in the 1990s. Although the use of irradiation as a method to reduce the numbers of bacteria on poultry was approved by the FDA in May 1990 and has industry support, it has yet to be accepted by consumers. Acceptance of irradiation in food processing should significantly reduce the likelihood of disease transmission.

As the dietary habits of the public change, most likely so will the agents of foodborne illness. For example, there has been an increase in the variety and quantity of fresh fruits and vegetables demanded, many of them imported. At the same time, the traditional meal prepared from raw ingredients and served at home is much less common today than in the past. Demand is moving to restaurant, takeout, and convenience foods, such as microwaveable and frozen foods.

Health Disparities

Within some ethnic communities, there are traditional foods and preparation processes that increase the likelihood of possible foodborne illness. Underreporting of illnesses due to factors such as access to health care may occur. Thus the effect of traditional ethnic foods and food preparation techniques on foodborne illness rates is difficult to evaluate. Often when people come from an area where refrigeration is not commonly available or used, it is thought to be unnecessary or just not considered.

Some foods not common in the United States must be studied to determine potential health risks. An example is *Balut* eggs, sold in some Asian markets. These are incubated eggs that are removed from incubation a few days before hatching and then maintained at room temperature.

Restaurants and grocery stores specializing in ethnic foods are increasing. These establishments are patronized both by members of their own ethnic community and an increasing number of nonminority customers who enjoy a diversity of foods. Most of the food sold in such stores is imported.

Nationally there has been a significant increase in the number of foods imported into the United States. Trade agreements such as North American Free Trade Agreement (NAFTA) have further enhanced this trend. However the present resources for inspection and sampling of the imported foods has not kept up with demand. The probability is then higher that the imported food has been processed in a way that is not equal to United States' standards. Because a majority of this food is consumed by racial and ethnic minorities, this trend could cause an increased probability for foodborne illness in certain communities. Some examples of ways imported food can be substandard include lead seams in canned goods, improper storage temperatures during food processing and transportation, and lead in candy from Mexico. The FDA and U.S. Customs are increasing efforts to improve inspections of facilities that export food to the United States and inspections of imported foods at ports of entry.

Current demand for employees in the food industry provides a significant employment opportunity for newly immigrated peoples. Training newly immigrated food handlers can be challenging not only because of language differences, but in also changing already known food-handling practices that were commonly accepted in immigrants' homelands, or in their homes, but are not acceptable in food establishments under the Food Code.

Public Health Infrastructure

LLCHD's Food Program provides inspection, technical assistance, and educational activities in Lancaster County. Community input on the program is provided by the Food Advisory Committee, compsed of both industry and citizen representatives. All inspectional statistics and permitting information is maintained by either LLCHD or the Nebraska State Department of Agriculture. Complaint and foodborne illness report data are kept by LLCHD.

Epidemiological surveillance and investigations of foodborne illnesses are

performed by the LLCHD Epi Team including the Health Director, Environmental Health Food Team, the Epidemiologist, Public Health Nursing Staff, and Health Promotion and Outreach representatives. Food is regulated by federal, state, and local agencies. The regulations are revised on a regular basis – generally every two years – to keep current. LLCHD policies and procedures will be maintained to assure adherence to policies reviewed by the local Food Advisory Committee and approved by the Board of Health. A community survey should be completed to provide data on the indicators selected.

Recommendations

- Continue the inspection of all food establishments and food facilities according to applicable codes (retail stores, processors, and warehouses). Emphasize critical items.
- Implement an electronic inspection system.
- Promote ongoing education of food establishment management on proper food sanitation and safety practices.
- Continue to require food manager and food handler education and testing as well as providing ongoing seminars and printed information.
- Expand food handler/manager education and permitting requirements to include farmer's markets, temporary food establishments, and event/festival markets.
- Expand consumer education on food safety issues in cooperation with the state and Lancaster County Extension Services.
- Develop a foodborne disease surveillance program and establish a medical committee to address foodborne disease.
- Maintain a proactive group of industry and public representatives to address current food protection problems.
- Research the feasibility of a chemical and biological monitoring program (random sampling).
- Promote chemical use awareness.
- Continue the "Hazard Analysis Critical Control Point" (HACCP) approach, focusing on menu items that epidemiological evidence has shown are most likely to cause foodborne disease if mishandling occurs.
- Provide consultative visits annually to high-risk establishments ("high risk being determined by the type of foods prepared or the history of the food establishment").
- Mandate food-handler permits for childcare providers.
- Assure regular routine inspections of nursing homes and residential care facilities.
- Promptly investigate all reported cases of foodborne illness and activate the epidemiological response team as necessary.
- Develop a random food sampling program especially focused on imported foods.
- Implement risk-based inspections.
- Educate emergency room doctors and care providers on foodborne illness and the importance of testing and reporting.

Notes

Related discussion or indicators are located in the chapters on *Public Health Emergency Management*, and *Immunization and Communicable Disease*.

Table 1

-- Currently no data available.

1. U.S. Dept. of Health and Human Services, Office of Public Health and Science, *Healthy People 2010 Objectives: Draft for Public Comment*, September 1998.
2. Lincoln Lancaster County Health Department, Communicable Disease and Epi sections. Incidence rates are shown for both 1998 alone and for the three year period of 1996–1998 (14.9 for salmonella and 11.9 for Campylobacter (11.9/100,000).
3. Nebraska Health and Human Services System, Public Health Assurance, Communicable Diseases Section. 1998 data provided by program staff.
4. U.S. Dept. of Health and Human Services, Office of Public Health and Science, *Healthy People 2010 Objectives: Draft for Public Comment*, September 1998. Preliminary 1997 data from active surveillance at FoodNet sites.
5. Currently no data available. Could be obtained through a community survey.
6. U.S. Dept. of Health and Human Services, Office of Public Health and Science, *Healthy People 2010 Objectives: Draft for Public Comment*, September 1998. 1998 data from the Food Safety Survey (FSS), FDA, planned for use every two to three years.
7. Common data source for local and state data on safe food handling at Food Establishments: Nebraska Department of Agriculture (NDA) data on Food Service (restaurant) facilities ("01" classification only).
8. Lincoln–Lancaster County Health Department. LLCHD analysis of NDA data on Food Service facilities inspected July 1, 1998 to June 30, 1999.
9. Currently no data available, but probably obtainable from NDA, Food Inspections section.
10. NDA, Food Inspections section.
11. Data is available, but tabulations are under development. Data will come from LLCHD analysis of raw NDA data on Food Service facilities inspected from July 1, 1998 to June 30, 1999. Food temperature violations are defined with codes: 81-2272.15, 3-401.11, 81-2272.16, 3-402.11, 3-403.11, 81-2272.19, 81-2272.20, 81-2272.21, 81-2272.22, 81-2272.23, 81-2272.26. Personal Hygiene Violations are defined with codes: 2-301.11, 81-2272.08, 2-302.11, 2-303.11, 2-304.11, 2-401.11, 81-2272.11, 3-301.12, 81-2272.10.
12. Lincoln–Lancaster County Health Department. LLCHD analysis of NDA data on Food Service facilities inspected July 1, 1998 to June 30, 1999. Average number of "Notice of Violation" and "Food Enforcement Notices" given for violation of Food Handler (average of 20 notices) and Food Manager (average of 7 notices) permit requirements, per 1000 regular inspections.

Table 2

1. Paul S. Mead, Laurence Slutsker, Vance Dietz, Linda F. McCaig, Joseph S. Bresee, Craig Shapiro, Patricia M. Griffin, and Robert V. Tauxe, Centers for Disease Control and Prevention, "Emerging Infectious Diseases: Food Related Illness and Death in the United States."

Narrative sources

1. The Educational Foundation, *Applied Foodservice Sanitation – A Certification Coursebook*, 1995.
2. Washington State Department of Health, Environmental Health Indicators, 1998.
3. Food and Drug Administration, *Healthy People 2000 Progress Review*, 1995.
4. Paul S. Mead, Laurence Slutsker, Vance Dietz, Linda F. McCaig, Joseph S. Bresee, Craig Shapiro, Patricia M. Griffin, and Robert V. Tauxe, Centers for Disease Control and Prevention, "Emerging Infectious Diseases: Food Related Illness and Death in the United States."
5. Public Health Service, *Healthy People 2000 Progress Report for Food and Drug Safety*.
6. <www.cdc.gov/ncidod/foodsafe/report.htm#foodborne>